

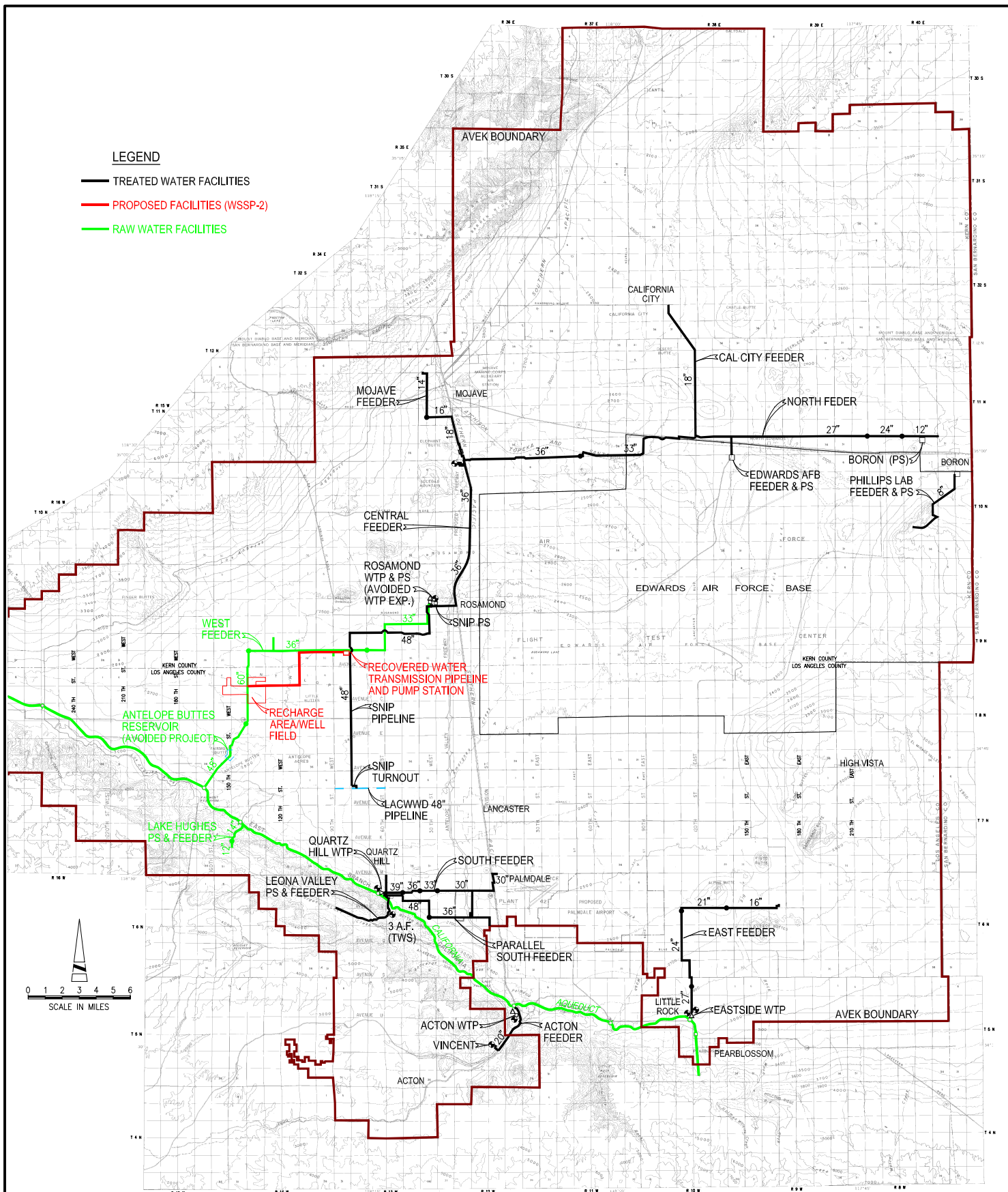
ATTACHMENT 7. ECONOMIC ANALYSIS: WATER SUPPLY COSTS AND BENEFITS

This Attachment provides estimates of capital and operation & maintenance (O&M) costs for the proposed Project (WSSP2) and an avoided project that would accomplish the same results at a higher cost.

The WSSP2 water banking project provides regional benefits in both water storage and water treatment. The Project avoids the construction of the Buttes Reservoir (for storage) and expansion of the existing AVEK Rosamond Water Treatment Plant (for treatment). Both of these projects have been previously studied by AVEK and not implemented because of cost. The Antelope Buttes Reservoir would store raw water from the California Aqueduct in a surface reservoir. Expanding the existing water treatment plant would provide capacity to treat water stored in the reservoir for potable use.

The locations of the proposed WSSP2 project facilities and the Antelope Buttes Reservoir and water treatment plant expansion are shown on Figure 1. From the Figure, it can be seen that of AVEK's four water treatment plants, three (Quartz, Acton, and Eastside) are located adjacent to the California Aqueduct. The Rosamond Water Treatment Plant receives SWP water through the West Feeder and provides treated water to Edwards Air Force Base and the northern portion of AVEK. Treated water can also be supplied to the Los Angeles County Waterworks District through the South-North Intertie Pipeline (SNIP).

WSSP2 would provide additional treated water for the northern portion of AVEK including Edwards Air Force Base. WSSP2 could also provide treated water to the Los Angeles County Waterworks District through the SNIP.



ANTELOPE VALLEY-EAST KERN WATER AGENCY

PROPOSITION 84 FACILITIES

AECOM
PROJECT NO.

60182837

FIGURE

1

PROPOSED PROJECT DESCRIPTION

This Proposal pertains to a single project designated as Water Supply Stabilization Project No. 2 (WSSP2). WSSP2 is a groundwater recharge and recovery project establishing an operational groundwater bank. WSSP2 includes the following components:

1. Development of 400 acres of recharge basins;
2. Increasing the output capacity of AVEK's existing West Feeder of the California Aqueduct with two new turnouts serving the recharge ponds.
3. Construction of 5 recovery wells;
4. Construction of collector pipelines from the wells;
5. Construction of a 7-mile transmission pipeline from the collector pipelines to;
6. A pump station that will pump the water into AVEK's existing potable transmission system for delivery to customers.

ANNUAL COSTS OF PROPOSED PROJECT (WSSP2)

Following is a detailed description of the annual costs involved with constructing WSSP2.

Administration

AVEK already has staff and administration throughout the region. The increase in administrative duties as part of this project is assumed to be negligible.

Operation

Electricity

Electrical demand is dependent upon the volume of water to be pumped each year through the wells and pump station. The anticipated amount of water to be pumped as part of this proposal is 20,000 acre-feet per year. Assuming a system head of 600 feet (250 feet static lift and 350 feet transmission loss), the power required is approximately 12,300,300 kWh/year. Assuming an electrical cost of \$0.15 per kWh, the annual electricity cost would be approximately \$1.84 million. This cost is equal to \$92 per acre-foot.

Chlorination

The recovered water requires chlorination prior to being pumped into the distribution system. The chlorination costs are estimated based on a chlorine dose of 3 mg/L at \$1.50 per pound of chlorine. Using this assumption, chlorine will cost about \$250,000 per year.

Staff

It is assumed that operation will require one staff member one day per week for an annual cost of \$25,000.

Variable Water Charge

There is a charge levied by the SWP to deliver water through the system to AVEK. A large portion of this cost is the electricity required to pump the water to AVEK turnout. This fee is variable and changes from year to year. On average, the cost to AVEK is \$180 per acre-foot. Using this average, the cost to take 20,000 AF would be \$3.6 million.

Maintenance

Annual maintenance for the facilities is assumed to be 1% of capital costs. The cost for maintenance includes the costs associated with monitoring and assessment as described in Attachment 6.

Replacement

All the pumps and motors in the project, both at the recovery wells and at the pump station, have a life of 20-years. Because of this, it will be necessary to replace each of pieces of equipment once during a 40-year period. It is assumed that replacement costs will equal the original installation costs.

The remaining facilities, including the pipeline and structures, are assumed to have a design life of 40-years or greater and will not require replacement.

Other

No other costs are anticipated.

Contingency

The contingency for the proposed project is estimated to be 30%. This estimate is based on a Class 4 estimate as defined by the Association for the Advancement of Cost Engineering (AACE), which is the same as previously used for capital costs in Attachment 4.

Summary

The following table summarizes the annual costs for the proposed project.

Administration	
	\$0
Operation	
Staff	\$25,000
Variable Water Charge	\$3,600,000
Electricity	\$1,840,000
Disinfection	\$250,000
Contingency	\$1,714,500
Total	\$7,429,500
Maintenance	
Total	\$366,769
Replacement	
Well Pump	\$650,000
Pipeline Pump	\$2,400,000
Contingency	\$915,000
Total	\$3,965,000
Other	
	\$0

Table 11. Annual Cost of Project

Table 11 summarizes the estimated 40-year life cycle cost of the project.

Table 11- Annual Cost of Project (All costs should be in 2009 Dollars) Project: Water Supply Stabilization Project No. 2									
	Initial Costs	Operations and Maintenance Costs ⁽¹⁾						Discounting Calculations	
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
YEAR	Grand Total Cost From Table 7 (row (i), column(d))	Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +...+ (f)	Discount Factor	Discounted Costs(g) x (h)
2009	\$0	\$0	\$0	\$0	\$0	\$0	\$0	1.000	\$0
2010	\$0	\$0	\$0	\$0	\$0	\$0	\$0	0.943	\$0
2011	\$37,573,572	\$0	\$0	\$0	\$0	\$0	\$37,573,572	0.890	\$33,440,479
2012	\$0	\$0	\$0	\$0	\$0	\$0	\$0	0.840	\$0
2013	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.792	\$6,174,645
2014	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.747	\$5,823,813
2015	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.705	\$5,496,370
2016	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.665	\$5,184,519
2017	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.627	\$4,888,261
2018	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.592	\$4,615,391
2019	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.558	\$4,350,318
2020	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.527	\$4,108,634
2021	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.497	\$3,874,746
2022	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.469	\$3,656,450
2023	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.442	\$3,445,951
2024	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.417	\$3,251,044
2025	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.394	\$3,071,730
2026	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.371	\$2,892,416
2027	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.350	\$2,728,694
2028	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.331	\$2,580,565
2029	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.312	\$2,432,436
2030	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.294	\$2,292,103
2031	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.278	\$2,167,363
2032	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.262	\$2,042,622
2033	\$0	\$0	\$7,429,500	\$366,769	\$3,965,000	\$0	\$11,761,269	0.247	\$2,905,033
2034	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.233	\$1,816,531
2035	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.220	\$1,715,179
2036	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.207	\$1,613,828
2037	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.196	\$1,528,069
2038	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.185	\$1,442,310
2039	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.174	\$1,356,551
2040	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.164	\$1,278,588
2041	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.155	\$1,208,422
2042	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.146	\$1,138,255
2043	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.138	\$1,075,885
2044	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.130	\$1,013,515
2045	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.123	\$958,941
2046	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.116	\$904,367
2047	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.109	\$849,793
2048	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.103	\$803,016
2049	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.097	\$756,238
2050	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.092	\$717,257
2051	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.087	\$678,275
2052	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.082	\$639,294
2053	\$0	\$0	\$7,429,500	\$366,769	\$0	\$0	\$7,796,269	0.077	\$600,313
Total Present Value of Discounted Costs (Sum of Column (i))									\$133,518,209
Transfer to Table 20, column (c), Exhibit F: Proposal Costs and Benefits Summaries									
Comments:									

(1) The incremental change in O&M costs attributable to the project.

AVOIDED PROJECTS DESCRIPTION

If the proposed Project is not constructed the alternative would be to construct separate storage and treatment facilities—essentially two projects would be needed to obtain the same benefits as the proposed Project. The two projects that would be needed if the proposed Project is not built are:

- The Antelopes Butte Reservoir for water storage; and,
- Expansion of the existing AVEK Rosamond Water Treatment Plant.

Both of these projects were the subjects of feasibility studies prepared for AVEK. Neither project was constructed because of their cost.

ANNUAL COSTS OF AVOIDED PROJECTS

If the proposed WSSP2 project is not constructed the alternative would be to construct storage and treatment facilities as a single project. The cost detail for the avoided project is separated into two parts for explanation purposes only. The storage facility would be a new surface reservoir, Antelope Buttes Reservoir. The treatment facility would be an expansion of AVEK's existing Rosamond Water Treatment Plant.

Antelope Buttes Reservoir

Since 1965 AVEK has considered constructing a surface reservoir for the purpose of storing water delivered from the California Aqueduct. Several feasibility studies were conducted for a site between the Antelope and Fairmount Buttes, about 15 miles west of the City of Lancaster in the Antelope Valley. The proposed reservoir would have a maximum storage capacity of 31,000 acre-feet and a water surface area of 630 acres. The southern end of the reservoir would have an earthen dike and the northern end would have the main dam. Based on preliminary studies and evaluations, AVEK determined the proposed site had favorable geology for dam construction with minimal environmental concerns.

Capital Costs

In 2001 AVEK conducted a feasibility study which estimated construction costs for the reservoir and related pump facilities at \$50 million. Using an update factor of 1.21, the estimated cost would be \$60.5 million in 2009 dollars.

Operation and Maintenance Costs

For the purposes of this avoided cost estimate, annual operation and maintenance costs are assumed 2% of the capital construction costs.

Replacement Costs

It is assumed that the design life of the reservoir will be greater than 40-years. Because of this, replacement costs are not included.

Electrical Costs

The operation cost considered is the electricity required to pump raw water from the reservoir to the AVEK Rosamond Water Treatment Plant. It is assumed that the pumping requirements for the reservoir will be equal to the pumping requirements for the proposed groundwater recharge project (\$1.84 million per year).

Variable Water Charge

The cost to import water to AVEK is the same as previously estimated with the annual costs (\$3.6 million). Reservoir evaporation losses are discussed in Annual Other Water Supply Benefits.

Contingency

The contingency for the avoided project is estimated to be 30%. This estimate is based on a Class 3 estimate as defined by the Association for the Advancement of Cost Engineering (AACE), which is the same as previously used in Attachment 4 for the proposed project contingency.

Avoided Cost Summary for Antelope Buttes Reservoir

The following table summarizes the avoided capital, replacement, and annual operations and maintenance costs associated with constructing the Antelope Buttes Reservoir.

Capital Cost	
Reservoir	\$60,500,000
Contingency	\$18,150,000
Total	\$78,650,000
Replacement Cost	
Total	\$0
Annual Operation & Maintenance Cost	
Electrical	\$1,840,000
Maintenance	\$1,190,000
Variable Water Charge	\$3,600,000
Contingency	\$1,989,000.0
Total	\$8,619,000

Expansion of Rosamond Water Treatment Plant

AVEK's existing Rosamond Water Treatment Plant was designed for a future expansion of 14 MGD treated capacity. The following avoided cost estimate looks at the capital, replacement, operation and maintenance costs associated with this avoided project.

Capital Costs

- **Filtration Equipment.** In 2004 AVEK explored the possibility of this expansion using membrane filtration. AVEK received a proposal from Pall Water Processing to supply the necessary equipment for the plant, which would have cost \$4.6 million for 14 MGD if it had been constructed. Using an update factor of 1.13, the plant equipment would cost \$5.2 million in 2009 dollars.
- **Plant Facilities.** It is estimated that the cost of constructing building, piping, and other systems to operate the treatment plant is approximately twice the cost of the membrane filters, or \$10.4 million. It is assumed that these facilities will have a 40-year life and will not require replacement.
- **Granular Activated Carbon Treatment.** GAC Treatment to remove DBP precursors would be need if the Antelope Buttes Reservoir were constructed (see Attachment 8).

Replacement Costs

The filters have a life of 20-years, at which point they must be replaced. If the project is analyzed over a 40-year period, a single replacement would be required. It is assumed that the replacement cost equal the original installation cost.

Annual Operation & Maintenance Costs

- **Electrical.** It is estimated that to treat 14 MGD using membrane filtration would require a pressure of 50 psi. Assuming a plant efficiency of 75%, the required pump power would be 285 KW. Assuming an electrical cost of \$0.15 per kWh, estimated power cost would be \$375,000 per year (assuming 24-hour operation each day) to operate the pumps. Note that these costs are to pump water through the treatment plant and into the distribution system only. Pumping raw water into the treatment plant is accounted separately with the Antelope Buttes Reservoir.
- **Disinfection.** The cost to chlorinate will be the same as previously estimated (\$250,000 per year).
- **Staff.** As this is would be an expansion of an existing facility, the administration and management costs of the facility are not expected to increase. It is estimated that 2 full time equivalent staff would be required to operate the plant expansion. Assuming an annual cost of \$125,000 per year per person, it would cost \$250,000 per year to staff.
- **Maintenance.** It is estimated that maintenance will cost approximately 2% of the total capital cost, which equals \$600,600 per year.

Contingency

The contingency for the avoided projects is estimated to be 30%. This estimate is based on a Class 3 estimate as defined by the Association for the Advancement of Cost Engineering (AACE), which is the same as previously used in Attachment 4 for the proposed project contingency.

Avoided Cost Summary for Expansion of Rosamond Water Treatment Plant

The following table summarizes the avoided capital, replacement, and annual operations and maintenance costs associated with constructing the expansion of the existing Rosamond Water Treatment Plant.

Capital Cost	
Filtration Equipment	\$5,200,000
Plant Facilities	\$10,400,000
Contingency	\$4,680,000
Total	\$20,280,000
Replacement Cost	
Plant Equipment	\$5,200,000
Equipment Life	20 years
Facility Life	40 years
Contingency	\$1,560,000
Total	\$6,760,000
Annual Operation & Maintenance Cost	
Staff	\$250,000
Electrical	\$375,000
Maintenance	\$600,600
Disinfection	\$250,000
Contingency	\$442,680
Total	\$1,918,280

Avoided Cost Summary

The following table summarizes the avoided capital and operation & maintenance costs associated with the Antelope Buttes Reservoir and the expansion of the Rosamond Water Treatment Plant.

	Antelope Buttes Reservoir	Expansion of Rosamond Water Treatment Plant	Total
Capital Cost	\$78,650,000	\$20,280,000	\$98,930,000
Replacement Cost	\$0	\$6,760,000	\$6,760,000
Annual Operation & Maintenance Cost	\$8,619,000	\$1,918,280	\$10,537,280

Table 13. Annual Costs of Avoided Projects

Table 13 summarizes the 40-year life cycle cost for constructing, operating, and maintaining the avoided projects.

Table 13 - Annual Costs of Avoided Projects
(All avoided costs should be in 2009 dollars)
Project: Water Supply Stabilization Project No. 2

	Costs				Discounting Calculations	
(a)	(b)	(c)	(d)	(e)	(f)	(g)
YEAR	Alternative (Avoided Project Name): Antelope Buttes Reservoir & Rosamond Water Treatment Plant Expansion				Discount Factor	Discounted Costs (e) x (f)
	Avoided Project Description: Construct a new surface reservoir with 31,000 AF of storage and expand an existing treatment plant by 14 MGD.					
	Avoided Capital Costs	Avoided Replacement Costs	Avoided Operations and Maintenance Costs	Total Cost Avoided for Individual Alternatives		
	(b) + (c) + (d)					
2009	\$0	\$0	\$0	\$0	1.000	\$0
2010	\$0	\$0	\$0	\$0	0.943	\$0
2011	\$98,930,000	\$0	\$0	\$98,930,000	0.890	\$88,047,700
2012	\$0	\$0	\$0	\$0	0.840	\$0
2013	\$0	\$0	\$10,537,280	\$10,537,280	0.792	\$8,345,526
2014	\$0	\$0	\$10,537,280	\$10,537,280	0.747	\$7,871,348
2015	\$0	\$0	\$10,537,280	\$10,537,280	0.705	\$7,428,782
2016	\$0	\$0	\$10,537,280	\$10,537,280	0.665	\$7,007,291
2017	\$0	\$0	\$10,537,280	\$10,537,280	0.627	\$6,606,875
2018	\$0	\$0	\$10,537,280	\$10,537,280	0.592	\$6,238,070
2019	\$0	\$0	\$10,537,280	\$10,537,280	0.558	\$5,879,802
2020	\$0	\$0	\$10,537,280	\$10,537,280	0.527	\$5,553,147
2021	\$0	\$0	\$10,537,280	\$10,537,280	0.497	\$5,237,028
2022	\$0	\$0	\$10,537,280	\$10,537,280	0.469	\$4,941,984
2023	\$0	\$0	\$10,537,280	\$10,537,280	0.442	\$4,657,478
2024	\$0	\$0	\$10,537,280	\$10,537,280	0.417	\$4,394,046
2025	\$0	\$0	\$10,537,280	\$10,537,280	0.394	\$4,151,688
2026	\$0	\$0	\$10,537,280	\$10,537,280	0.371	\$3,909,331
2027	\$0	\$0	\$10,537,280	\$10,537,280	0.350	\$3,688,048
2028	\$0	\$0	\$10,537,280	\$10,537,280	0.331	\$3,487,840
2029	\$0	\$0	\$10,537,280	\$10,537,280	0.312	\$3,287,631
2030	\$0	\$0	\$10,537,280	\$10,537,280	0.294	\$3,097,960
2031	\$0	\$0	\$10,537,280	\$10,537,280	0.278	\$2,929,364
2032	\$0	\$0	\$10,537,280	\$10,537,280	0.262	\$2,760,767
2033	\$0	\$6,760,000	\$10,537,280	\$17,297,280	0.247	\$4,272,428
2034	\$0	\$0	\$10,537,280	\$10,537,280	0.233	\$2,455,186
2035	\$0	\$0	\$10,537,280	\$10,537,280	0.220	\$2,318,202
2036	\$0	\$0	\$10,537,280	\$10,537,280	0.207	\$2,181,217
2037	\$0	\$0	\$10,537,280	\$10,537,280	0.196	\$2,065,307
2038	\$0	\$0	\$10,537,280	\$10,537,280	0.185	\$1,949,397
2039	\$0	\$0	\$10,537,280	\$10,537,280	0.174	\$1,833,487
2040	\$0	\$0	\$10,537,280	\$10,537,280	0.164	\$1,728,114
2041	\$0	\$0	\$10,537,280	\$10,537,280	0.155	\$1,633,278
2042	\$0	\$0	\$10,537,280	\$10,537,280	0.146	\$1,538,443
2043	\$0	\$0	\$10,537,280	\$10,537,280	0.138	\$1,454,145
2044	\$0	\$0	\$10,537,280	\$10,537,280	0.130	\$1,369,846
2045	\$0	\$0	\$10,537,280	\$10,537,280	0.123	\$1,296,085
2046	\$0	\$0	\$10,537,280	\$10,537,280	0.116	\$1,222,324
2047	\$0	\$0	\$10,537,280	\$10,537,280	0.109	\$1,148,564
2048	\$0	\$0	\$10,537,280	\$10,537,280	0.103	\$1,085,340
2049	\$0	\$0	\$10,537,280	\$10,537,280	0.097	\$1,022,116
2050	\$0	\$0	\$10,537,280	\$10,537,280	0.092	\$969,430
2051	\$0	\$0	\$10,537,280	\$10,537,280	0.087	\$916,743
2052	\$0	\$0	\$10,537,280	\$10,537,280	0.082	\$864,057
2053	\$0	\$0	\$10,537,280	\$10,537,280	0.077	\$811,371
Total Present Value of Discounted Costs (Sum of Column (g))						\$223,656,786
(% Avoided Cost Claimed by Project						100%
Total Present Value of Discounted Avoided Project Costs Claimed by alternative Project (Total Present Value of Discounted Costs x % Avoided Cost Claimed by Project)						\$223,656,786
Comments:						

ANNUAL OTHER WATER SUPPLY BENEFITS

The WSSP2 is a water banking project allowing the Antelope Valley Region to import excess water supplies allocated to the Region or available during abnormally wet periods and store them in the local groundwater basin. These supplies will then subsequently be available for recovery and use during dry and high demand periods. The Region is currently dependent on the year-to-year allocations of State Water Project (SWP) water that fluctuate considerably as a result of weather patterns in the SWP watershed and environmental constraints in the Bay Delta.

Currently, during dry years when SWP supplies are curtailed, the Region is forced to negotiate with willing sellers of water and pay a premium for these supplies to be imported in order to meet the Region's annual water needs. In addition, in years where the amount of SWP water allocated to the Region exceeds the current demands, the Region is unable to store these supplies in reserve for subsequent dry periods or future demands, effectively forfeiting millions of dollars worth of water available to the Region.

The three State Water Project Contractors that serve the Antelope Valley have a combined Table A, or maximum, allocation of SWP supplies of 165,000 acre-feet (AF). DWR estimates that during normal years the SWP will be able to deliver 60% of Table A amounts to Contractors, representing a yearly supply for the Region of less than 100,000 AF. During a single-dry year event, or the worst case SWP water supply scenario, DWR estimates the SWP will be able to deliver 7% of Table A amounts to Contractors, or less than 12,000 AF for the Antelope Valley. During such an event, the State Water Project Contractors that serve the Antelope Valley must, therefore, purchase up to 90,000 AF from a willing seller in order to be able to deliver the same volume of water that is available to the Region during normal years.

Reduced Storage Capacity from (Avoided) Antelope Buttes Reservoir

The WSSP2 provides the mechanism for the Region to begin to address this problem. The WSSP2 will have the capacity to store 20,000 AF of water annually up to a total of 150,000 AF in the local groundwater basin when supplies exceed demands. The avoided Antelope Buttes Reservoir would have a fixed storage capacity of only 31,000 AF. In this scenario, if demand exceeds the 31,000 AF storage capacity (assuming the reservoir was initially full), additional water would have to be purchased to make up the deficit. It is estimated that 120,000 AF of water would need to be purchased over 12-years or 10,000 AFY during the 40-year project life.

Water which is sold by a willing seller is referred to as "Dry-Year" water. This Dry-Year water would require a special purchase of water from AVEK. Dry-Year Water is only available when farmers with allocated water supply chose to sell that water rather than use it for agricultural operations. Typically this occurs when the value of that water is greater than the value of the agricultural commodity. On average, it costs AVEK an additional \$300/AF to purchase Dry-Year Water when it is available along with the Variable Water Charge of \$180 /AF to transport it.

The cost of purchasing and transporting 10,000 AF in a single year would be about \$4.8 million.

Evaporation Losses from (Avoided) Antelope Buttes Reservoir

The previously described avoided project, Antelope Buttes Reservoir, would be located in an arid desert environment where surface evaporation is a major concern. According to a 2003 USGS report (Simulation of Ground-Water Flow and Land Subsidence, Antelope Valley Ground-Water Basin, California) the pan evaporation rate in Antelope Valley is 114 inches per year. With a reservoir water surface area of 630 acres, approximately 6,000 AFY will be lost due to evaporation. To maintain the water level in the reservoir, additional water would be required beyond AVEK's standard Table A allocation from the SWP.

As previously mentioned, on average, it costs AVEK an additional \$300/AF to purchase Dry-Year Water when it is available along with the Variable Water Charge of \$180 /AF to transport it.

The annual cost of maintaining the reservoir level (replacement of 6,000 AFY) would cost \$2.88 million.

Table 14. Annual Other Water Supply Benefits

Table 14 summarizes the 40-year life cycle cost for purchasing needed water that would be avoided by constructing WSSP2.

Table 15. Total Water Supply Benefits

Table 15 summarizes the 40-year life cycle cost for both the avoided projects and annual other water supply benefits.

Table 14 - Annual Other Water Supply Benefits
(All benefits should be in 2009 dollars)
Project: Water Supply Stabilization Project No. 2

(a)	(b)	(c)	(d)	(e)	(f)
Year	Type of Benefit	Description of Benefit	Annual Benefits (\$) ⁽¹⁾	Discount Factor ⁽¹⁾	Discounted Benefits (d) x (e) ⁽¹⁾
2009			\$0	1.000	\$0
2010			\$0	0.943	\$0
2011			\$0	0.890	\$0
2012			\$0	0.840	\$0
2013	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.792	\$1,948,320
2014	a	Cost of water that cannot be stored in the avoided Antelope Buttes Reservoir.	\$4,800,000	0.747	\$3,585,600
2014	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.747	\$1,837,620
2015	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.705	\$1,734,300
2016	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.665	\$1,635,900
2017	a	Cost of water that cannot be stored in the avoided Antelope Buttes Reservoir.	\$4,800,000	0.627	\$3,009,600
2017	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.627	\$1,542,420
2018	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.592	\$1,456,320
2019	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.558	\$1,372,680
2020	a	Cost of water that cannot be stored in the avoided Antelope Buttes Reservoir.	\$4,800,000	0.527	\$2,529,600
2020	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.527	\$1,296,420
2021	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.497	\$1,222,620
2022	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.469	\$1,153,740
2023	a	Cost of water that cannot be stored in the avoided Antelope Buttes Reservoir.	\$4,800,000	0.442	\$2,121,600
2023	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.442	\$1,087,320
2024	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.417	\$1,025,820
2025	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.394	\$969,240
2026	a	Cost of water that cannot be stored in the avoided Antelope Buttes Reservoir.	\$4,800,000	0.371	\$1,780,800
2026	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.371	\$912,660
2027	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.350	\$861,000
2028	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.331	\$814,260
2029	a	Cost of water that cannot be stored in the avoided Antelope Buttes Reservoir.	\$4,800,000	0.312	\$1,497,600
2029	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.312	\$767,520
2030	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.294	\$723,240
2031	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.278	\$683,880
2032	a	Cost of water that cannot be stored in the avoided Antelope Buttes Reservoir.	\$4,800,000	0.262	\$1,257,600
2032	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.262	\$644,520
2033	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.247	\$607,620
2034	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.233	\$573,180
2035	a	Cost of water that cannot be stored in the avoided Antelope Buttes Reservoir.	\$4,800,000	0.220	\$1,056,000
2035	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.220	\$541,200
2036	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.207	\$509,220
2037	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.196	\$482,160
2038	a	Cost of water that cannot be stored in the avoided Antelope Buttes Reservoir.	\$4,800,000	0.185	\$888,000
2038	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.185	\$455,100
2039	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.174	\$428,040
2040	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.164	\$403,440
2041	a	Cost of water that cannot be stored in the avoided Antelope Buttes Reservoir.	\$4,800,000	0.155	\$744,000
2041	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.155	\$381,300
2042	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.146	\$359,160
2043	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.138	\$339,480
2044	a	Cost of water that cannot be stored in the avoided Antelope Buttes Reservoir.	\$4,800,000	0.130	\$624,000
2044	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.130	\$319,800
2045	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.123	\$302,580
2046	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.116	\$285,360
2047	a	Cost of water that cannot be stored in the avoided Antelope Buttes Reservoir.	\$4,800,000	0.109	\$523,200
2047	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.109	\$268,140
2048	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.103	\$253,380
2049	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.097	\$238,620
2050	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.092	\$226,320
2051	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.087	\$214,020
2052	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.082	\$201,720
2053	b	Cost of water to offset evaporation from avoided Antelope Buttes Reservoir.	\$2,460,000	0.077	\$189,420
Total Present Value of Discounted Benefits Based on Unit Value (Sum of the values in Column (f) for all Benefits shown in table)					\$50,886,660
Comments:					

(1) Complete these columns if dollar value is being claimed for the benefit.

Table 15. Total Water Supply Benefits

(All benefits should be in 2009 dollars)

Project: Water Supply Stabilization Project No. 2

Total Discounted Water Supply Benefits (a)	Total Discounted Avoided Project Costs (b)	Other Discounted Water Supply Benefits (c)	Total Present Value of Discounted Benefits (d) (a) + (c) or (b) + (c)
\$0	\$223,656,786	\$50,886,660	\$274,543,446

Comments: The avoided project includes both the construction of the Antelope Buttes Reservoir and expansion of the existing Rosamond Water Treatment Plant Expansion.